WORKING GROUP ASSESSMENT PROCESS, PROTOCOL, AND METHODOLOGY

PROCESS AND PROTOCOL

The Working Group assessment process combined the resources of headquarters and field staffs of the U.S. Department of Energy (DOE). The entire highly enriched uranium (HEU) vulnerability assessment—planning, conducting reviews, analyzing results, writing reports—required over 60,000 person-hours spread over 6 months and involved over 300 people. Advantages of this process include thoroughness, speed, independence, consistency, openness, consensus, and ownership of results.

The HEU Working Group comprised about 120 persons from DOE Headquarters and Operations Offices, site contractors, consultants, and external stakeholder organizations. Working Group members had expertise in HEU chemistry, metallurgy, and processing; health physics; industrial hygiene; facility engineered systems; operations and maintenance; nuclear criticality; fire protection; natural phenomena hazards; and safety analyses. A project support group provided day-to-day technical and administrative assistance to the assessment.

Site Assessment Teams (SATs) generally consisted of two coleaders, one each from the DOE Operations Office and the site contractor, as well as individuals knowledgeable about HEU facilities and operations at the sites. Working Group Assessment Teams (WGATs) consisted of individuals independent of the sites they reviewed: a DOE Federal employee as the leader, one or more deputy leaders, and experts in all appropriate technical areas. The SAT leaders, all members of the WGATs, and the project support group were given extensive training and orientation on the assessment process, protocol, and methodology, and on unique aspects of HEU facility hazards.

Site Assessment Teams performed initial self-assessments at all 22 sites with HEU facilities. These teams responded to questions about HEU storage and operations; identified potential vulnerabilities through facility walkdowns, interviews, and document reviews; and presented their results in SAT Reports.

Working Group Assessment Teams reviewed, verified, and validated the site assessments on behalf of the Working Group. These teams visited 11 sites. They spent up to 4 weeks on-site, depending on the number and complexity of facilities, in addition to weeks of preparation and report writing. A special WGAT, called the Home Team, reviewed SAT Reports from the remaining 11 sites with small HEU holdings. The Home Team also visited 3 of these sites. The Site Assessment, Working Group Assessment, and Home Teams generated reports of their results.

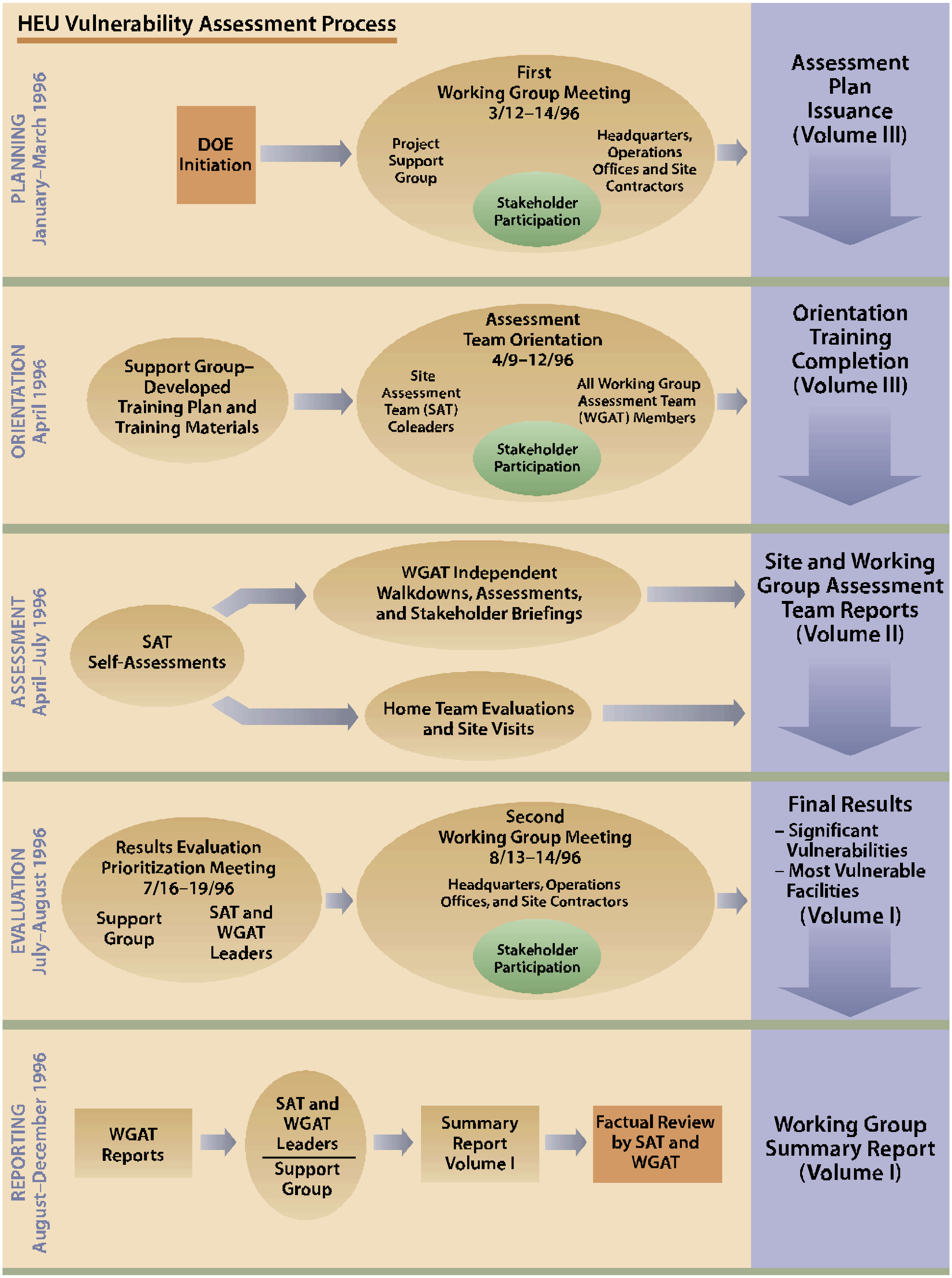
Several external stakeholder organizations were involved, including:

- Regional public interest groups
- Union representatives
- U.S. Senate committee staffs
- State representatives and advisory boards
- U.S. Nuclear Regulatory Commission
- U.S. Environmental Protection Agency
- International Atomic Energy Agency
- Defense Nuclear Facilities Safety Board
- The news media

At the first Working Group meeting, stakeholders were involved in developing the assessment plan (Volume III), which included the process, protocol, and methodology for the assessment. At the second meeting, stakeholders participated in evaluation and characterization of the vulnerabilities that were identified during the assessment.

Regional stakeholders, including State representatives and regulators, were involved in WGAT in-briefings and exit briefings at individual sites. Site Operations Offices arranged the involvement of citizen/public interest groups and the news media.

The extent of site stakeholder involvement varied. At some sites, stakeholders had DOE security clearances and walked down facilities with WGATs. For example, two retired Y–12 Plant employees with 40 years of experience in Buildings 9212 and 9206 and now part of Citizens for National Security, a regional interest group, attended meetings and toured several buildings with the WGAT. Technical and historical information provided by these two retirees was valuable to the assessments. Three employees of the Tennessee Department of Environment and Conservation and a local union representative also attended some of the meetings and toured


HEU Vulnerability Assessment Process
PLANNING
January–March 1996
DOE Initiation
First Working Group Meeting 3/12–14/96
Project Support Group
Headquarters, Operations Offices and Site Contractors
Stakeholder Participation
Assessment Plan Issuance (Volume III)
ORIENTATION
April 1996
Support Group–Developed Training Plan and Training Materials
Assessment Team Orientation 4/9–12/96
Site Assessment Team (SAT) Coleaders
All Working Group Assessment Team (WGAT) Members
Stakeholder Participation
Orientation Training Completion (Volume III)
ASSESSMENT
April–July 1996
SAT Self-Assessments
WGAT Independent Walkdowns, Assessments, and Stakeholder Briefings
Home Team Evaluations and Site Visits
Site and Working Group Assessment Team Reports (Volume II)
EVALUATION
July–August 1996
Results Evaluation Prioritization Meeting 7/16–19/96
Support Group
SAT and WGAT Leaders
Second Working Group Meeting 8/13–14/96
Headquarters, Operations Offices, and Site Contractors
Stakeholder Participation
Final Results
– Significant Vulnerabilities
– Most Vulnerable Facilities
(Volume I)
REPORTING
August–December 1996
WGAT Reports
SAT and WGAT Leaders
Support Group
Summary Report Volume I
Factual Review by SAT and WGAT
Working Group Summary Report (Volume I)

buildings. Another local interest group, the Oak Ridge Environmental Peace Alliance, participated in the public in-briefing and exit briefing, where security clearances were not required. A member of the Rocky Flats Citizens Advisory Board toured Building 886 to gain first-hand knowledge of some of the vulnerabilities. Participation was also significant at the Idaho National Engineering Laboratory, the Portsmouth Gaseous Diffusion Plant, and the Savannah River Site.

To promote the Secretary's openness initiatives, DOE shared initial data and preliminary results of the assessment with stakeholder participants. For many sites, the local news media reported preliminary results.

METHODOLOGY

The assessment methodology used by the HEU Working Group is known as target-barrier-hazard analysis. This approach involves evaluating the barriers between hazardous materials (e.g., HEU) and targets (i.e., workers, the public, and the environment) under normal and accident conditions.

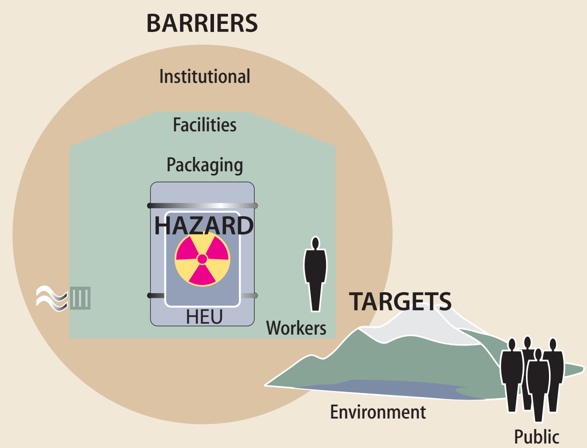
Barriers are the material packaging, facility engineered features, and managerial systems and administrative controls used to prevent the release of material or nuclear criticality. Facility engineered features can be structures and systems such as storage racks, vaults, gloveboxes, monitors and alarms, fire protection systems, ventilation systems, and high-efficiency particulate air (HEPA) filters. Management systems and administrative controls—e.g., safety analysis, maintenance, radiation protection, configuration management, training, controls on the amount of HEU or U-233 permitted in an area to preclude nuclear criticality—are generally procedural.

The teams established three categories of vulnerabilities: facility condition, material/packaging, and institutional. They classified vulnerabilities in terms of the likelihoods and consequences of events involving breakdowns of the barriers in question. Any barrier defect was deemed a vulnerability, the intent being to ensure that weaknesses in all functions specific to hazard prevention were identified and thoroughly evaluated. For the purpose of reducing uncertainty and ensuring uniformity in assessment across the complex, team members determined the maximum potential for consequences of each vulnerability, in some cases without giving credit for temporary or ad hoc corrective measures taken pending the completion of more tangible long-term measures.

Three likelihood classes (high, low, and very low) and three radiological consequence classes (high, medium, and low) were established. The radiological consequence classes are similar to those of the plutonium ES&H vulnerability assessment. Although adopted specifically for the HEU assessment, the toxicological classification criteria were never the controlling factor in consequence classification. The high- and low-likelihood classes are similar to those used in the plutonium assessment. The very low likelihood class includes events such as the earthquakes and airplane crashes that were addressed in the plutonium assessment, as well as other events, like large facility fires, that although credible are not expected during a facility's lifetime. Although institutional vulnerabilities might be the underlying causes of facility condition and material/packaging vulnerabilities, they could not be classified in terms of likelihood and consequence.

The assessment sought to prioritize individual vulnerabilities. Prioritization schemes were developed and used to determine the most significant vulnerabilities and the most vulnerable facilities. During its second meeting, the Working Group reviewed all data and results of the Site Assessment, Working Group Assessment, and Home Teams, and organized the results for reporting.

Target-Barrier-Hazard Analysis



Hazards include HEU, U-233, and other types of collocated or commingled hazardous materials.

Barriers include packaging and containers of hazardous materials; facility and all engineered features important to safety; and facility management systems and administrative controls.

Targets include facility workers, the public, and the environment.

Vulnerabilities can be viewed as potential breaks in barriers that protect the worker, the public, or the environment, and are of the following types:

Facility Condition Vulnerability—deficiency or degradation of facility physical barriers such as the building structure, equipment, or systems important to safety or environmental protection.

Material/Packaging Vulnerability—deficiency or degradation of the package or container for the material due to aging, corrosion, radiolytic damage, or location.

Institutional Vulnerability—breakdown in management systems or administrative controls used to ensure safety or environmental protection (e.g., radiological protection program, facility operational safety requirements, training program).

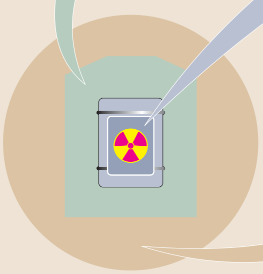
Methodology

FACILITY BARRIERS

- Fire Suppression System
- Gloveboxes
- Transfer System
- Ducts
- Filters (HEPA)
- Vaults
- Storage Racks
- Rooms
- Hot Cell/Canyons
- Hoods
- Piping
- Shielding
- Distance
- Remote Handling
- Confinement System
- Burial Ground
- Tanks
- Alarm Systems
- Temporary Barriers
- Liquid Containment/Dikes
- Bays, Cells, Magazines
- Canyons
- Pads
- Trenches
- Alarm System

MATERIAL/PACKAGING BARRIERS

- Disassembled Weapons Components
- Metals
- Oxides
- Compounds
- Holdup
- Sources, Samples, and Standards
- Combustibles
- Noncombustibles
- Process Residues
- Solutions
- Reactor Fuel
- Hazardous Materials
- Cans
- Plastic Packaging
- Metal Foil
- Vessels
- Glass
- Plastic Containers
- Unknown
- Drums
- Tanks
- Wooden Crates and Boxes
- Shipping Containers and Overpacks
- Cumulative Inventory Difference



INSTITUTIONAL BARRIERS
(Management Systems and Administrative Controls)

- Radiological Protection Program
- Nuclear Criticality Safety Program
- Material Limits
- Configuration Control Program
- Quality Assurance Program
- Conduct of Operations Program
- Authorization Basis; Safety Analysis Program
- Training Program
- Maintenance Program
- Emergency Response Program
- Personal Reliability Assurance Program
- Lessons-Learned Program
- Standards Program
- Procedures:
  - Operations
  - Maintenance
  - Operational Safety Requirements
  - Shift Orders
  - On-site Review Committee Approvals
- Document Control Program
- Surveillance Program
- Nuclear Criticality Limits (e.g., mass or concentration controls, double contingency)
- Unreviewed Safety Question Process

Likelihood and Consequence Classification Criteria

LIKELIHOOD CLASSIFICATION

Classification	Very Low (VL)	Low (L)	High (H)
Vulnerability Likelihood	Credible events; ordinarily not likely to occur in facility lifetime (over 50 years)	Events likely to occur within facility lifetime but not within 5 years (5–50 years)	Condition prevalent or likely to occur within 5 years (0–5 years)

CONSEQUENCE CLASSIFICATION

Classification	Low (L)	Medium (M)	High (H)
Worker (W) Consequence	Radiological dose below annual regulatory limit (5 rem CEDE). A lower cutoff of 5 mrem calculated CEDE was used	Radiological dose equal to or above annual regulatory limit (5 rem CEDE)	Radiological dose equal to or above 50 rem CEDE
	Uranium intake equal to or above 1.2 mg	Uranium intake equal to or above 12 mg	Uranium intake equal to or above 120 mg
	Chemical exposure equal to or above ERPG 1	Chemical exposure equal to or above ERPG 2	Chemical exposure equal to or above ERPG 3
Public (P) Consequence	Radiological dose below annual regulatory limit (100 mrem CEDE); formal notification required. A lower cutoff of 1 mrem calculated CEDE was used	Radiological dose equal to or above annual regulatory limit (100 mrem CEDE)	Radiological dose equal to or above 1 rem CEDE (threshold for emergency response)
	Uranium intake equal to or above 0.12 mg	Uranium intake equal to or above 1.2 mg	Uranium intake equal to or above 12 mg
	No ERPG listed. Judgment-based	Chemical exposure equal to or above ERPG 1	Chemical exposure equal to or above ERPG 2
Environmental (E) Consequence	On-site contamination equal to or above 100 dpm/100 cm^2 and below 1000 dpm/100 cm^2	On-site contamination equal to or above 1,000 dpm/100 cm^2, or off-site contamination below 1,000 dpm/100 cm^2 and above 100 dpm/100 cm^2.	Off-site contamination equal to or above 1,000 dpm/100 cm^2.

Key: rem, roentgen equivalent man; CEDE, committed effective dose equivalent; ERPG, Emergency Response Planning Guide; dpm, disintegrations per minute.